Appendix 2

Harris Internet Reply Affidavit

BEFORE THE FEDERAL COMMUNICATIONS COMMISSION

WASHINGTON, D.C. 20554

In the Matter of Applications of WorldCom, Inc. and MCI Communications Corporation for Transfer of Control of MCI Communications Corporation to WorldCom, Inc.	CC Docket No. 97-211

Internet Reply Affidavit of Robert G. Harris on behalf of GTE Corporation

JUNE 8, 1998

Internet Reply Affidavit of Robert G. Harris
On Behalf of GTE Corporation
CC Docket No. 97-211

Table of Contents

I. Introduction

1. The purpose of this declaration is to highlight a number of factors that cause the Internet-related portions of the MCI-WorldCom merger to be anticompetitive and to respond to criticisms of my earlier declaration put forward by Drs. Carlton and Sider. I reiterate that backbones and ISPs operate in separate relevant product markets. Then I explain that different methods for measuring backbone market share all corroborate the fact that the combined MCI-WorldCom would have a dominant and anticompetitive position in the backbone services market. I show, despite claims to the contrary by MCI-WorldCom economists, that MCI-WorldCom has an incentive to employ a strategy of targeted degradation against competing backbones. There are a number of barriers to entry in the backbone services market that would preclude new entrants from entering the market and gaining share in response to anticompetitive actions by MCI-WorldCom. Finally, I describe a number of potential strategic responses by MCI-WorldCom's backbone competitors and customers such as signing transit agreements, switching backbones, establishing sub-networks or buying coalitions, and multihoming and explain why these strategies are unlikely to succeed in preventing MCI-WorldCom from successfully exercising its market power and increasing its dominance. These factors all point to one conclusion, that this merger should not be permitted to go forward.

II. The Backbone Product Market is Distinct from the ISP/On-Line Services Market

2. Although MCI-WorldCom disputes the product and geographic market definitions in my earlier declaration, their economists do not. In fact, the responses of Drs. Carlton and Sider specifically separate backbone issues from ISP issues. (See especially paragraphs 80 and 92.)[1] This position is further supported by the March 1997 FCC staff paper on the Internet and Telecommunications which defined ISPs and backbone providers as separate entities:

> Internet service providers (ISPs), such as Netcom, PSI, and America Online, connect those end users to Internet backbone networks.[2]

They provide a retail service, including reselling wholesale connectivity to end users as well as other retail-related functions such as email accounts, dial-up

---

[1] *Second Declaration of Dennis W. Carlton and Hal S. Sider*, Dated March 19, 1998, pp. 39, 43.

[2] Kevin Werbach, "Digital Tornado: the Internet and Telecommunications Policy", *FCC Office of Plans and Policy*, March 1997, p.12.

modems, proprietary content, navigational tools, and customer service. Some large end user customers such as businesses and universities perform ISP functions because they purchase wholesale connectivity services and aggregate smaller end users customers.

3. Backbone providers, on the other hand, such as MCI, UUNet, and Sprint, route traffic between ISPs, interconnect with other backbones and lack a substantial transit dependence on other service providers. Only providers who carry Internet traffic at high speeds on diverse routes across geographically dispersed areas (for example coast-to-coast within the U.S.) qualify as backbone providers. Although many companies are vertically integrated and provide both backbone and ISP services, this does not change the fact that these companies are providing two economically distinct functions. For example, although UUNet is a major backbone, it also provides some ISP services.

4. For the reasons discussed above, as well as for the reasons set forth in my earlier declaration, and not questioned by MCI-WorldCom's economists, the backbone service market is a separate relevant product market from the ISP market.

III. Different Backbone Market Share Measures Corroborate the Capacity-Based Market Shares

A. Revenue-based market share data corroborates capacity-based calculations

5. My earlier declaration used information contained in a recent Frost & Sullivan study to calculate a backbone market share in the 40-50 percent range based on revenues. In their second reply, MCI-WorldCom insisted that MCI-WorldCom's Internet Service Provider (ISP) market share based on revenues was only 20 percent.[3] They argued that their calculation of total ISP revenue was appropriate because they had excluded advertising and web-hosting revenue,[4] and included online services and ISP revenues.[5]

---

[3] *WorldCom and MCI Second Joint Reply*, Dated March 20, 1998, p.73. Also note that Carlton and Sider do not take issue with my methodology for calculating market shares based on revenues.

[4] *WorldCom and MCI Second Joint Reply*, Dated March 20, 1998, p.73.

[5] The Frost & Sullivan study reported that in 1996 the Total Internet Services Revenue was estimated to be $2.5 billion, and that advertising and web-hosting revenues would be respectively 3.4 percent and 5.0 percent of the total revenue. Taking 8.4 percent out of $2.5 billion would give $2.3 billion, which appears to be how MCI-WorldCom came up with the total revenue figure for 1996.

The disagreement between my approach and that of MCI-WorldCom centers on whether ISPs (including on-line service providers such as AOL) provide a different "product" than do the backbone service providers. As described above, they clearly do.

6. Therefore, revenues associated with ISPs should be excluded to obtain an accurate indication of MCI-WorldCom's market share in the backbone services market. Based on the data cited by MCI-WorldCom, it is straightforward to remove the revenues associated with on-lines services, a subset of ISPs defined to include AOL/CompuServe and MSN. This removal results in a market share for MCI-WorldCom in the range of 40 percent, as mentioned in my earlier declaration. I made this estimate in the following manner. The Frost & Sullivan Internet market report projected that 48.3 percent of the total 1997 Internet service revenue would be online service revenue.[6] Using MCI-WorldCom's assumption that the total Internet service revenue in 1997 would be $5 billion,[7] the Frost & Sullivan estimate implies that the online service revenue in 1997 would be $2.415 billion.[8]

7. The Frost & Sullivan estimate of online revenue is fairly close to publicly reported financial results. AOL had online service revenues of $1.429 billion in 1997[9] and CompuServe reported $584 million in online service revenues.[10] Given that MSN had approximately the same number of subscribers as CompuServe,[11] I estimated they

---

[6] "Figure 3-2: Total Internet Services Market, Percent of Revenues by Services Type (US) 1992-2002", *US Internet Service Markets*, Copyright 1996 Frost & Sullivan, p.3-10.

[7] In the first joint reply of WorldCom and MCI, they projected that the total 1997 Internet service revenue would be double the amount of the 1996 figure. The Frost & Sullivan $2.5 billion estimate of total 1996 Internet service revenue implies that the WorldCom and MCI's 1997 estimate would be $5 billion. See *WorldCom and MCI Joint Reply*, Dated January 26, 1998, footnote 124, p.73, and "Figure 3-1: Total Internet Services Market, Revenue Forecasts (US) 1992-2002", *US Internet Service Markets*, Copyright 1996 Frost & Sullivan, pp.-7.

[8] $5 billion * 48.3 percent = $2.415 billion.

[9] "Management's Discussion and Analysis of Financial Condition and Results of Operations," *America Online Form 10K for the fiscal year ended June 30, 1997.*

[10] According to BoardWatch, CompuServe reported $842 million in revenue in 1997, of which $258 million was backbone services related. Therefore, CompuServe had $584 million in online service revenue in 1997. See "WorldCom, Inc.: CompuServe Network Services," *BoardWatch Internet Service Providers Directory for Fall 1997*, Copyright BoardWatch Magazine, 1997, p.229.

[11] *The BoardWatch ISP Directory* indicates that CompuServe had 2.6 million and MSN had 2.3 million subscribers as of Fall 1997. See "National Dial-Up Access Providers,"

also had $584 million in revenues, making the total for all online service revenues slightly over that estimated by Frost & Sullivan. Please note that the figures cited above as publicly reported on-line revenues for AOL and CompuServe were actually calculated by netting out the revenues of the backbones associated with AOL (ANS) and CompuServe (CNS) to estimate only online services revenues for these companies.

8. By eliminating the on-line services' non-backbone revenues from the total Internet service revenue cited by MCI-WorldCom and using the new reduced denominator for a market share calculation, WorldCom-MCI's market share would be more than 38 percent. If the revenues of the thousands of ISPs that do not provide backbone services are eliminated as well,[12] I would be surprised to see a revenue-based market share estimate for MCI-WorldCom's backbone services that is not in the 40-50 percent range.[13]

B. Additional data also corroborates the capacity-based market share measures

9. Recent statements by the European Union Competition Commissioner Karl Van Miert also recognize that the combined MCI-WorldCom would have a dominant market share.

> "In view of the market shares calculated on the basis of both revenues and traffic flows, Commissioner Van Miert would like to reiterate his view that this merger would lead to the creation of a dominant position in the supply of top-level Internet connectivity,"[14]

10. Based on conversations with GTE's counsel, I understand there is additional corroborative market share evidence available that GTE would be prepared to disclose upon adoption of a suitable protective order by the Commission.

BoardWatch Internet Service Providers Directory for Fall 1997, Copyright BoardWatch Magazine, 1997, pp. 291, 305.

[12] *The BoardWatch ISP directory* for Fall 1997 lists over 4000 ISPs. See: *BoardWatch Internet Service Providers Directory for Fall 1997*, Copyright BoardWatch Magazine, 1997, pp. 320-520.

[13] It would also be necessary to eliminate the ISP and content services revenues of MCI and WorldCom from both the numerator and denominator of the market share estimate. These are relatively small amounts.

[14] Reuters Report, *EU's Van Miert Blasts WorldCom/MCI Merger on Internet Issue,* May 26, 1998.

IV. Given the Existence of Network Externalities, Targeted Degradation is a Plausible Strategy for MCI-WorldCom and is Not "Bizarre and Unreal"

11. The implications of the market share data cited in my earlier affidavit are clear – if other backbones providers such as GTE do not have efficient interconnections with the MCI-WorldCom backbones, the speed of their own networks will be dramatically degraded for nearly 50 percent of their customers' traffic.

12. This dominant market share enjoyed by MCI-WorldCom gives them certain anticompetitive advantages in the Internet backbone market as I explained in my earlier affidavit. MCI-WorldCom and Drs. Carlton and Sider attempt to minimize MCI-WorldCom's market dominance by developing theoretical behavioral responses by competitors that are even more complicated and burdensome than what they called the "truly bizarre and unreal scenario"[15] of targeted degradation by MCI-WorldCom laid out in my earlier declaration.[16] In their scenarios, some of the market participants react to MCI-WorldCom's actions by attempting to coordinate their responses. The fact of the matter is that MCI-WorldCom will be so large, and the rest of the players will be so small, that it will take massive coordination to have any impact. For example, the top two players, MCI-WorldCom and Sprint, combined will have over 60 percent of the market, the third player will have a market share of less than 10 percent, and no one else will have greater than a 2-3 percent market share. To have any noticeable impact, it would probably take the coordinated action of a dozen or more of these smaller entities, which is unlikely given the potential costs and difficulties involved. I address these issues in more detail below.

13. Its high market share, taken together with the presence of network externalities in the Internet industry, will leave MCI-WorldCom with a significant advantage over all other players. Network externalities cause the value of a network to increase with the number of users connected to the network. In a network of networks like the Internet, if all networks are seamlessly interconnected, the networks will share the externalities. However, those networks which do not have adequate connectivity with the dominant network (such as MCI-WorldCom post-merger), will have noticeably inferior service. Also, the post-merger MCI-WorldCom will place less value on maintaining efficient

---

[15] *WorldCom and MCI Second Joint Reply*, Dated March 20, 1998, p.83.

[16] My "bizarre and unreal scenario" is also theoretically supported by other economic scholars. See discussion below. Also, *arguendo,* if GTE did manage to coordinate with several other backbone providers to form a sub-network and reduce their reliance on the MCI-WorldCom backbone, they would still need an efficient interconnection with MCI-WorldCom to reach the subscribers of AOL/CompuServe and MSN. AOL alone claims that more than 50 percent of the household time spent in cyberspace is spent on AOL. See AOL Press Release, *AOL's Entertainment Channel is the Most Popular Entertainment Destination in Cyberspace*, March 23, 1998.

interconnections with individual small backbones than small backbones do on interconnecting with MCI-WorldCom. As discussed in my earlier declaration, the extensive literature on the economics of networks and the presence of externalities indicates that this asymmetry provides MCI-WorldCom with the ability and incentive to downgrade its interconnections with other backbones to gain market share. MCI-WorldCom could thus attempt to appropriate the value of network externalities for itself.

14. In a recent report submitted to the European Commission, Drs. Cremer, Rey, and Tirole use economic theory and modeling to analyze the merger's impact on Internet backbone markets. Their report finds that the serial degradation scenario I described in my earlier declaration would be "quite a sensible policy for WorldCom/MCI."[17] In an appendix to the report which specifies and describes their model of Internet backbone incentives, they state:

> Consider a large backbone (MCI-WorldCom) facing two medium-sized backbones (GTE and Sprint). Head-to-head competition in the form of a simultaneous degradation of interconnection with the two medium-sized backbones can be costly to the large backbone. A more profitable strategy is to "divide-and-conquer:" degrade the interconnection with one medium-sized backbone while limiting the capacity of the interconnection in order to avoid transit.[18]

15. MCI-WorldCom claim that "wholly unexplained is how MCI-WorldCom would orchestrate this scheme, with the exquisite timing it would require: how long, for example, would MCI-WorldCom degrade interconnections with GTE before it moved on to another one of the thirty-plus backbone providers?"[19] In fact, because of the tremendous growth rate of the Internet, degrading interconnections would not require exquisite timing. Degradations would instead occur *de facto* as the result of MCI-WorldCom slowing down its continuous upgrade of interconnection capacity with competing backbones.

---

[17] Jacques Cremer, Patrick Rey and Jean Tirole, *The Degradation of Quality and the Domination of the Internet*, April 22,1998, p.11.

[18] Jacques Cremer, Patrick Rey and Jean Tirole, "Appendix I: A Model of Strategic Internet Backbone Interconnection," *The Degradation of Quality and the Domination of the Internet*, April 22, 1998, p.2.

[19] WorldCom and MCI Second Jointly Reply, Dated March 20, 1998, pp. 83-84.

16. According to the Department of Commerce, Internet traffic is doubling approximately every 100 days. [20] Unless interconnection capacity expansions keep pace with the traffic growth, the interconnection points will become increasingly congested. Thus, if interconnection capacity was held constant for more than a few months, there will be increasing delays at interconnection points. Once delays get sufficiently large (i.e. when the peak hour data arrival rate exceeds the interconnection service capacity) the delays would increase without bound (i.e. toward infinity) and the overloaded system would be forced to drop packets, leading to substantial service quality deterioration.[21] The resulting service degradations would cause some of the backbones' customers to change providers.

17. The Fall 1997 issue of *BoardWatch* shows UUNet has an average installation time of 8-10 weeks for new T-3 interconnections, depending on supplier availability. Unanticipated delays as minimal as an additional couple of weeks could have significant deleterious effects on the interconnections between MCI-WorldCom and their smaller competitors who are near peak hour capacity.

18. This analysis also provides another insight because it not only applies to interconnections between backbones, but also to interconnections *within* a particular backbone network. Networks need to allocate their resources between upgrades of their own networks and upgrades to interconnections with other networks. A small backbone service provider would probably find it equally valuable, if not more valuable, to allocate its scarce resources to upgrading interconnections with the larger networks than to upgrade the interconnections within its own system. This is because the effect on overall speed of delays in "on-net" traffic is small relative to the effect on overall network speed from delays in traffic being exchanged with other networks.

19. On the other hand, post-merger MCI-WorldCom will have so much traffic "on-net" that it will have strong incentives to focus on upgrading the interconnections within its own network compared to interconnections with other networks. If it were still concerned about the efficiency of interconnections with other systems, MCI-WorldCom

---

[20] Lynn Margherio, Dave Henry, Sandra Cooke, Sabrina Montes and Kent Hughes, "Introduction," *The Emerging Digital Economy*, p.2.

[21] Even a simple example will demonstrate this effect. Assume λ is the arrival rate of IP packets at an interconnection point and the inter-arrival times are distributed exponentially (i.e. Poisson arrivals) and μ is the service rate at which packets are transferred across the interconnection point. Provided that $\lambda < \mu$, in equilibrium, the expected total time (time waiting in queue + service time) it takes to pass through the interconnection point is $1/(\mu-\lambda)$. As λ approaches μ, the waiting time in the queue gets long. If λ exceeds μ then an equilibrium will not exist and the waiting time increases without bound. See Lawrence Lapin, *Quantitative Methods for Business Decisions*, Harcourt Brace Jovanovich, Inc., pp. 567-590, for a review of queuing theory.

would be likely to focus on maintaining interconnections with its next largest providers. By the time MCI-WorldCom is done upgrading its interconnections with other large providers, it would then be necessary to upgrade its own system again, and so on. It is likely that many smaller providers never make it to the top of the list. Thus, even absent a deliberate effort by MCI-WorldCom to degrade connectivity with other backbones, the companies' post-merger incentives will inevitably lead it to engage in actions which reinforce its dominant position at the expense of promoting cross-network interconnection and maintaining a healthy competitive environment. This is another reason why no single entity should be permitted through merging or anticompetitive actions to control a dominant share of the backbone market.

20. Finally, I would like to specifically respond to the argument that MCI-WorldCom would not attempt to engage in anticompetitive behavior because they would lose revenues and market shares. This argument is incorrect because it assumes that MCI-WorldCom would not have market power resulting from its dominant market share. Because MCI-WorldCom would have such a dominant backbone market share, even disgruntled ISP customers and competing backbones would be extremely reluctant to cancel their connections to MCI-WorldCom for fear of losing connectivity to nearly 50 percent of the Internet. As pointed out by Drs. Cremer, Rey, and Tirole, customers of MCI-WorldCom are more likely to find adequate "on-net" substitutes for content on degraded backbones than are customers served by smaller backbones who would lose access to content on MCI-WorldCom backbones.[22] Customers of smaller backbones are thus likely to switch to MCI-WorldCom to be "on-net" with the dominant backbone. MCI-WorldCom's dominance would be a dynamically self-reinforcing phenomena which would result in increasing revenues and market shares and would probably ultimately lead to unwanted regulation of Internet service companies.

V. Barriers to Entry Will Prevent New Backbones from Establishing Themselves and Competing with MCI-WorldCom

21. Drs. Carlton and Sider state that the availability of a standard interconnection protocol and the absence of barriers to entry greatly facilitate the emergence of new competitors in the backbone services market. Existing Internet firms can rapidly adjust their network configurations to changes in prices by incumbent backbones and switch their connections to the new entrants. Drs. Carlton and Sider claim that the ability to switch backbones, combined with the savings that can be achieved by networking and aggregating traffic, enables firms to reduce their reliance on even a "dominant" Internet backbone provider.[23] Drs. Carlton and Sider cite data showing the growth of backbones

---

[22] Jacques Cremer, Patrick Rey and Jean Tirole, *The Degradation of Quality and the Domination of the Internet*, April 22,1998, pp.-8.

[23] *Second Declaration of Dennis W. Carlton and Hal S. Sider*, Dated March 19, 1998, pp.39-40.

and ISPs over the last year to "provide strong evidence of the absence of barriers to entry into the provision of Internet backbone services."[24]

A. The combined MCI-WorldCom's dominant market share and massive network externalities serve as a barrier to entry to competing backbones

22. There is no question that the market is currently competitive and is growing at a tremendous rate. The data provided by Drs. Carlton and Sider support this analysis. However, Drs. Carlton and Sider fail to address the fundamental issue raised by this merger which is "how will the backbone services market function after MCI-WorldCom becomes the dominant backbone?" It is the very size of the MCI-WorldCom backbone, its massive network externalities, and the dependence of existing backbones and new entrants on efficiently interconnecting with MCI-WorldCom that will distort competition in MCI-WorldCom's favor and cause a substantial barrier to entry. If the MCI-WorldCom merger is consummated, the backbone market will be dramatically restructured. One backbone network, MCI-WorldCom, will enjoy enormous network externalities. As a result, MCI-WorldCom will be much less dependent on its connections to other individual backbones. This diminished dependence on other service providers will give the MCI-WorldCom backbones insurmountable leverage to dictate the terms, conditions, and pricing of interconnection. At the other extreme, smaller backbone providers such as new entrants will be totally dependent on being able to interconnect with the dominant backbone in order to create value on their network. This asymmetric relationship with the dominant provider leaves the smaller providers without any leverage and subject to the terms and conditions imposed by the dominant backbone. Thus, for a new backbone entrant, MCI-WorldCom could render its entry impossible by not providing adequate interconnection capacity.

B. Network externalities often create a snow ball effect that reinforces the dominant provider and hinders attempts at entry

23. Another facet of the network externality-induced barrier to entry faced by both existing competitors and new backbones comes from the "snow ball or bandwagon effect" which is enjoyed by the dominant player in a network industry with proprietary or quasi-proprietary standards. By degrading its interconnections with other backbones, MCI-WorldCom would be effectively converting what is currently an open network (today's Internet) into a partially-closed or quasi-proprietary system controlled by MCI-WorldCom. I want to point out that I am not suggesting MCI-WorldCom would abandon the basic TCP/IP protocol. However, by degrading interconnection with competing backbones, MCI-WorldCom would create the functional equivalent to quasi-proprietary

---

[24] *Second Declaration of Dennis W. Carlton and Hal S. Sider*, Dated March 19, 1998, p.45.

standards because ISPs and others who were directly "on-net" would get faster, more reliable interconnection with each other compared to "off-net" users.

24. When different proprietary networks are competing with each other for customers, the one with the largest installed base of customers often has insurmountable strategic advantages and will ultimately dominate the other system. ISPs, on-line services, content providers, and end users will desire to be "on-net" with the dominant MCI-WorldCom backbone. In a self-fulfilling prophecy, consumers (end users), hardware producers (ISPs and web hosting farms) and software producers (web sites and content providers) all flock to the system with the highest installed base because they expect the largest network to drive its competitors out or to the fringes of the market. It is interesting to note that the recently announced *Yahoo! Online powered by MCI Internet* is emphasizing its affiliation with the MCI backbone. According to one Yahoo! Online press release:

> Yahoo! Online powered by MCI Internet features fast reliable Internet connections from MCI Internet, one of the world's most powerful and reliable Internet networks. [25]

25. This could be an early indication of the beginning of the "snow ball' effect of consumer expectations and network externalities in the Internet backbone market. These forces can combine quickly to reinforce the dominance of the largest provider within a networked industry and prevent other providers from even attempting to enter the market and challenge the dominant provider. I would point out that the merger by itself, without any actual attempt by MCI-WorldCom to degrade interconnections with competing backbones, is likely to substantially alter consumer and competitor expectations, making customers and competitors believe quite rationally that MCI-WorldCom would be likely to degrade interconnection in the future, and could set off the "snow ball" effect described above. Any attempt by MCI-WorldCom to promote this perception via actual degradation, subtle signaling of intent via advertising, press releases or other public statements would cause the "snow ball" to gather speed and momentum.

C. MCI-WorldCom could impose further barriers to entry by establishing proprietary standards for new Internet services

26. MCI-WorldCom could use its dominant market share in backbone services to try to unilaterally impose proprietary standards for certain types of Internet services. For example, as businesses desire to use the Internet for time sensitive, mission-critical business applications or for IP voice telephony or video conferencing, it will become

---

[25] MCI Press Release, *Yahoo! Online Powered by MCI Internet Now Available: Combines Yahoo!'s Popular Web Programming and Internet Navigation with MCI's Fast, Reliable Internet Access*, March 16, 1998.

increasingly important for backbones to offer class of service (COS) pricing to ensure that traffic is treated differently according to the priority and willingness to pay of the user. If WorldCom-MCI introduced a proprietary standard for COS pricing, competing backbones would have no way of offering services dependent on high priority carriage to customers served by the WorldCom-MCI backbone or to their own customers who wanted to access content or end users served by MCI-WorldCom except by prior arrangement with WorldCom-MCI. Such agreements would be unlikely to be forthcoming, because it would not be in the economic interest of WorldCom-MCI to cooperate. The establishment of these types of proprietary standards could become an enormous barrier to entry into the backbone market and could cause existing backbones to rapidly lose customers to MCI-WorldCom.

27. If a small competing backbone developed an innovative new service which might, in the long-term, threaten to undermine MCI-WorldCom's dominance, MCI-WorldCom could degrade interconnection with the company and copy the innovation or purchase the competitor outright. Note that the threat that MCI-WorldCom would degrade interconnection with a smaller competitor and copy their innovations would be likely to reduce the competitor's reservation price for an MCI-WorldCom purchase. This strategy would be similar to the one Microsoft has used with many small software companies.

D. Public peering points, which are increasingly congested, are the only option new entrants have for achieving interconnection

28. Both theoretical and empirical evidence suggests that smaller backbones and ISPs are only able to interconnect with each other and with the larger players at the public access points, such as NAPs and MAEs because private interconnections are not an economic alternative for smaller backbones. Since any potential entrants into the backbone services market will be relatively small at first and then grow, they initially will likely need to rely on adequate interconnections at public peering points.

29. As I explained in my earlier declaration, public interconnection points are more cost-effective locations for smaller backbones and ISPs to interconnect with each other because they can use a single transmission facility to achieve interconnection with multiple other service providers. Thus, NAPs allow for substantial economies of scale because the fixed costs of buying or building the transmission to the interconnection point can be spread over multiple bi-lateral interconnections. MCI-WorldCom concedes that "[e]specially for ISPs that exchange small volumes of traffic, interconnection through a NAP may be cost-effective."[26]

30. As I explained in my earlier affidavit, it is common knowledge that the public interconnection points are congested and increasingly serve as a bottleneck on the Internet. According to the May 1998 issue of *BoardWatch*:

---

[26] *WorldCom and MCI Second Joint Reply*, Dated March 20, 1998, p.67.

"[T]he four original NAPS have emerged as major bottlenecks to Internet performance. Traffic has expanded enormously, and getting it through the NAPS themselves has proven to be a huge performance problem. With Keynote Systems, we've run over 10 million discrete web page download measurements crisscrossing the network in nearly every conceivable direction. What has emerged is that most of the performance problems appear to be exhibiting themselves in the interconnect space. Two networks can both work admirably across their entire topography. But if you put a client on one and a server on the other, it can look very bad very quickly if you try to time packets crossing the chasm. The NAPS are the lion's share of this problem – they inherently have too many packets in one room."[27]

31. This congestion leaves the smaller backbones and ISPs stuck between the proverbial rock and a hard place. The NAPs are the only cost-effective locations for them to peer. But the NAPs are increasingly congested and provide inadequate service. WorldCom owns two key NAPs (MAE East and MAE West), and congestion difficulties are likely to be exacerbated by the MCI-WorldCom merger. The combined company will have even less incentive to devote resources to alleviating the congestion in the NAPs than WorldCom has today as a stand-alone company. In fact, by keeping the NAPs congested, MCI-WorldCom will cause smaller backbones to rely on obtaining private interconnections that will tend to favor the dominant MCI-WorldCom backbone. If MCI-WorldCom uses its ownership of the public interconnection points to slow down the expansion of interconnection capacity provided, there it would be a powerful hindrance to the emergence and competitiveness of smaller backbones.

E. Building a new backbone is not a costless and instantaneous process

32. Furthermore, even excluding all the barriers to entry I described above, I want to point out that establishing a new backbone service provider is not an instantaneous and costless process as implied by MCI-WorldCom. Constructing a national high-speed backbone network costs millions of dollars to pay for transport facilities, a 24-hour network operations center and routers. These components need to be integrated together into a single backbone system which requires the procurement of a substantial amount of scarce Internet network engineering talent, establishing interconnection agreements with other backbones and implementing of billing, customer support, sales and other back-office systems. Finally, it is unlikely that a start up backbone would have the technical capability to immediately provide all of the cutting edge functionality such as class of

[27] Jack Rickard, *Yet Another Unique Moment in Time Peering Redux – Back to the Future and the Essentials of a Competitive Internet*, BoardWatch Magazine, May 1998.

service pricing, real time IP voice telephony and video conferencing which will be increasingly important services on the Internet in coming years.

VI. The Strategic Responses Posited By Drs. Carlton and Sider and Others to MCI-WorldCom's Anticompetitive Practices Would Not Mitigate MCI-WorldCom's Market Power

33. In this section I describe a number of potential strategic responses by competing backbones and ISPs to attempts by MCI-WorldCom to degrade traffic exchanges and explain that, in each case, the strategies cannot overcome the fundamental advantage enjoyed by MCI-WorldCom due to their dominant market share and massive network externalities.

A. Transit agreements will not allow backbones to escape degradation

34. Drs. Carlton and Sider state that a backbone facing above-competitive interconnection charges or degraded traffic exchanges from MCI-WorldCom could terminate its interconnection agreement with MCI-WorldCom, but retain access to MCI-WorldCom by establishing an agreement (known as a transit agreement) with a third-party backbone which was itself interconnected with MCI-WorldCom.[28]

35. To decide whether to pursue this strategy, a backbone service operator ("Backbone A") would weigh the cost of MCI-WorldCom's above market interconnection rate against the costs associated with interconnecting to MCI-WorldCom through a third-party backbone ("Backbone B"). If Backbone A relies on Backbone B for its interconnection to MCI-WorldCom, it is likely to get an inferior connection to MCI-WorldCom, significantly slowing down its own network. There are two main reasons why this connection is likely to be inferior. First, Backbone A's interconnection to and transit across Backbone B might cause congestion on Backbone B's backbone. Second, if Backbone A chose to interconnect with Backbone B as a means of indirectly interconnecting to MCI-WorldCom, the existing interconnections between Backbone B and MCI-WorldCom would become increasingly congested and would need to be upgraded that much sooner. MCI-WorldCom could then "slow roll" the upgrade of Backbone B's interconnection. Another option for MCI-WorldCom would be to detect and block transit traffic from Backbone A carried on Backbone B while still permitting Backbone B's traffic to pass through the interconnection un-degraded.[29]

---

[28] *Second Declaration of Dennis W. Carlton and Hal S. Sider*, Dated March 19, 1998, p.41.

[29] This is clearly technically possible. For example, the CIX route filters (i.e. blocks) the traffic of any ISP which does not pay the CIX annual fee of $10,000. See: Jack Rickard,

36. As predicted by the Cremer, Rey, and Tirole model, Backbone B might refuse to enter into a transit agreement with the degraded backbone and try to gain market share at the degraded backbone's expense.[30] Backbone B might also avoid cooperating with Backbone A, for fear of incurring the wrath of MCI-WorldCom. Further, if Backbone B did agree to provide transit services to Backbone A, it would have to pass on any increased charges from MCI-WorldCom to Backbone A.

B. ISPs who switch backbones will not necessarily escape MCI-WorldCom price increases

37. Drs. Carlton and Sider claim that an ISP can switch backbone providers in response to an attempt by MCI-WorldCom to increase the price of interconnection,[31] by leasing a private line to establish an interconnection to a competing backbone's point of presence (POP). The ISP could then obtain access to MCI-WorldCom by transiting through this new backbone interconnection. Drs. Carlton and Sider further claim that the ISP's ability to aggregate its traffic with its new backbone supplier and realize economies of scale in obtaining interconnection with MCI-WorldCom reduces the benefit to MCI-WorldCom of increasing interconnection prices in the first instance.

38. This strategy makes sense for the ISP only if it believes there is no threat of MCI-WorldCom degrading the service between its new backbone provider and MCI-WorldCom. However, I have explained earlier that MCI-WorldCom is likely to degrade interconnection with other backbones. Most ISPs are highly risk averse when it comes to suffering traffic flow degradations and thus unlikely to risk switching to backbones which might subsequently be degraded. Instead, ISPs are likely to preserve their links to the dominant MCI-WorldCom backbone. Ultimately, the quality-adjusted price paid by ISPs for backbone service is likely to be lower for MCI-WorldCom services even after a price increase than for services purchased from other backbones because these other backbones will offer lower quality connectivity due to degradation by MCI-WorldCom.

39. The development of new Internet services such as IP telephony, real-time video conferencing, and mission-critical business applications will further reinforce ISPs' dependence on the dominant backbone. As customers rely on these new services, ISPs

---

"Editor's Note: The Big, The Confused, And The Nasty", *BoardWatch Magazine*, June 1997. http://www.boardwatch.com/mag/97/june/bwm1.htm.

[30] Jacques Cremer, Patrick Rey and Jean Tirole, *The Degradation of Quality and the Domination of the Internet*, April 22, 1998, p.11.

[31] *Second Declaration of Dennis W. Carlton and Hal S. Sider*, Dated March 19, 1998, p.39.

will need to be interconnected with the backbone provider that has the most "on-net" traffic and the least possibility of traffic flow disruptions because the economic damage from congestion will become larger. That backbone will, of course, be MCI-WorldCom due to the fact that it has the largest proportion of "on-net" traffic. Ultimately, an ISP will have strong incentives to maintain its connection with MCI-WorldCom.

C. MCI-WorldCom could deter the emergence of buying coalitions or sub-networks

40. Drs. Carlton and Sider also state that if MCI-WorldCom attempted to charge ISP customers a supra-competitive price, various ISPs could form a "sub-network" and aggregate their traffic. This may enable them to take advantage of economies of scale in obtaining Internet backbone access from MCI-WorldCom and realize savings relative to the costs faced by the ISPs individually.[32] Further, they claim that the absence of barriers to establishing connections between ISPs enables ISPs to reduce their reliance on MCI-WorldCom by exchanging certain types of traffic in a "sub-network," activity which would have been performed by MCI-WorldCom.[33] Presumably, competing backbones could employ a similar strategy if MCI-WorldCom attempts to charge them supra-competitive prices or degrade their interconnections.

41. There are a number of reasons why this response is likely to fail. First, there is no reason to believe that if MCI-WorldCom charged supra-competitive prices for individual connections, it would not similarly charge supra-competitive rates for a combined entity's interconnection unless the combined entity was large enough to achieve negotiating leverage, which as I explain below is unlikely to occur.

42. Second, there are substantial transaction costs associated with this type of traffic pooling and aggregation. These costs include the additional cost of leasing high speed circuits to the point of interconnection with the other ISPs, devising a routing plan, and upgrading routing and other shared equipment on a regular basis to keep connection speeds maximized. Each ISP would also incur the additional administrative burden of maintaining the interconnection with the other. The entire process of aggregation of traffic between and among ISPs itself adds additional operating uncertainty, including more complex hardware and software configurations, greater maintenance and up-front costs, and greater chances for failures and costly downtime. Given all the transactions costs, MCI-WorldCom could clearly extract rents from ISPs and backbones up to the

---

[32] *Second Declaration of Dennis W. Carlton and Hal S. Sider*, Dated March 19, 1998, p.39.

[33] *Second Declaration of Dennis W. Carlton and Hal S. Sider*, Dated March 19, 1998, p.39.

point where its above cost rents are equal to the increased transactions costs and risks third party backbones and ISPs incur from aggregating their traffic.

43. Despite all of these costs, however, an argument can be made that if a significant number of ISPs, representing a sizable chunk of the market, banded together to seek pricing concessions from MCI-WorldCom, the company would take notice. However, this would require a massive amount of coordination with a large number of participants (especially because MCI-WorldCom already has long-term arrangements with AOL/CompuServe and MSN), and would be difficult to pull off. Even if they managed to band together, an easy response for MCI-WorldCom would be to provide side deals to some of the larger ISPs in the group, giving them a significant competitive advantage over the others, and destroying the coalition.

44. Drs. Robert Innes and Richard Sexton have done theoretical work on the question of bargaining between a monopolist and customers attempting to form countervailing coalitions to respond to the monopolist.[34] This work is applicable to the Internet backbone market. Drs. Innes and Sexton conclude that:

> the monopolist is able to deter coalitions because coalition formation is costly, implying that he can convert the coalitions' formation costs into profit that would not be attainable if he were to bargain collectively with consumer coalitions.[35]

45. They also conclude that under certain conditions, which, as I explain below, apply to the Internet backbone market, the monopolist finds it particularly effective to make side deals to split apart the coalition. The monopolist can use a "divide-and-conquer pricing strategy that extracts consumer rents beyond those obtainable from savings on coalition formation costs."[36]

46. The conditions which are ripe for using a "divide-and-conquer" strategy are present when the consumers, in this case ISPs, have to immediately decide between two options: (1) join the coalition and defer purchasing the service while negotiating with the

---

[34] Robert Innes and Richard J Sexton, "Customer coalitions, monopoly price discrimination and generic entry deterrence," *European Economic Review*, 37, 1993, p. 1569-1597.

[35] Robert Innes and Richard J Sexton, "Customer coalitions, monopoly price discrimination and generic entry deterrence," *European Economic Review*, 37, 1993, p.1571.

[36] Robert Innes and Richard J Sexton, "Customer coalitions, monopoly price discrimination and generic entry deterrence," *European Economic Review*, 37, 1993, p.1571.

monopolist or (2) to accept the monopolists offering. When these are the only two options (i.e., it is not possible to both join the coalition and negotiate with the monopolist and temporarily continue buying from the monopolist under existing terms while the negotiation proceeds), the monopolist can exert additional pressure on the consumers by applying "take it or leave it" conditions to its service offerings. In the case of the Internet, a monopoly backbone could apply "take it or leave conditions" by threatening to immediately degrade or cut off the connectivity of individual existing ISP customers who were attempting to form a coalition to negotiate with the backbone unless they immediately agreed to individually accept the backbone's terms and conditions. This would effectively prevent the individual backbones from getting together to form a collective response to MCI-WorldCom's prices and terms. MCI-WorldCom can inject the element of immediacy into this process because ISPs can not afford to be unconnected or to have severely degraded connections to the Internet for any length of time without risking massive customer defection and bankruptcy. Customers (like ISPs) who require a continuous supply of a good or service (such as backbone connectivity) and can not stockpile it for use during the negotiations with the monopolist are thus particularly vulnerable to "take it or leave it" tactics.

47. Absent a successful "sub-network" in which the vast majority of non-AOL/CompuServe/MSN ISPs aggregated their traffic, it seems very unlikely that the formation of a "sub-network" could provide significant relief from having to depend on the MCI-WorldCom backbone to reach others.

D. Multihoming is not sufficient to mitigate MCI-WorldCom's market power

48. One strategy that ISPs and other backbone customers might use if MCI-WorldCom tries to degrade traffic with competing backbones would be to multihome with two or more backbones to try to avoid the degraded interconnection points. Multihoming is defined as routing Internet traffic over two or more different backbone connections based on current traffic flow conditions. For a number of reasons, I believe such a strategy would be unlikely to change the Internet backbone balance of power. Multihoming, which was designed for Internet backbones and not ISPs, is technically difficult and would substantially raise the costs of many ISPs and other backbone customers. Multihoming requires the use of Boundary Gateway Protocol (BGP) and many ISPs would not have the expertise or resources to implement it.[37] According to the trade press, "implementing BGP is a very complex and expensive process in terms of software and memory."[38] Other expenses come from establishing connections to multiple

[37] For a detailed technical description of the issues involved in implementing BGP and multihoming see "Using the Border Gateway Protocol for Interdomain Routing," at http://www.cisco.com/univercd/cc/td/doc/cisintwk/ics/icsbgp4.htm#11590.

[38] Chris Lewis and Thanh Nguyen, "Multihoming Your Internet Service with BGP," *Network Computing*," July 15, 1997.

backbones. For example, an ISP or backbone that was interconnected to UUNet with a T-3 line that desired to "multihome" by connecting with Sprint would have to spend another $20,620/month for 45 MBPS T-3 service to Sprint.[39]

49. Although theoretically possible, using multihoming to dynamically route traffic based on congestion patterns is almost impossible in practical terms for all but the largest, most sophisticated ISPs. It would be necessary to have highly skilled technicians continually monitoring traffic flow data and manually changing routing tables accordingly. In addition to the labor expenses associated with these activities, this type of manual intervention into routing tables creates large possibilities for erroneous routes to be broadcast and for system malfunctions to occur. Even a small error by an ISP could have grave consequences for traffic management, causing massive amounts of traffic to be incorrectly routed to the ISP from the outside world, leading to service disruptions and causing other Internet providers to reduce technical cooperation with the offending ISP.

50. Even if ISPs and other backbone customers found it technically feasible to multihome, it would only reinforce MCI-WorldCom's dominance. Because MCI-WorldCom post-merger would have such a large Internet market share, approaching 50 percent, and no other backbone would carry more than approximately 15 percent of traffic, ISPs served by MCI-WorldCom would have the smallest incentives to multihome and ISPs not served by MCI-WorldCom would have the strongest incentives to multihome and would likely multihome to MCI-WorldCom. Consider the case of ISPs served by the next largest backbone which had approximately a 15% share. If MCI-WorldCom degraded traffic exchanges with this backbone, the ISPs served by this backbone would experience delays nearly 50 percent of the time but MCI-WorldCom customers would only experience delays 15 percent of the time. If ISPs served by the next largest backbone decided to multihome, they would, in all likelihood, chose to multihome with MCI-WorldCom in order to be "on-net" with the largest backbone controlling nearly 50 percent of the market share. Some of these ISPs might eventually drop their connections to other backbones altogether to save the expenses associated with multihoming. In any case, as more new ISPs multihomed to MCI-WorldCom, its traffic and revenue share would increase. Conversely, ISPs served by MCI-WorldCom would have much smaller incentives to multihome to any other backbones and many would chose not to do so. ISPs served by MCI-WorldCom which choose not to multihome would not be accessible to other backbones except via MCI-WorldCom, and competing backbones would have no way of bypassing degraded interconnections with MCI-WorldCom when they want access to end users or content served by these single-homed ISPs.

51. In fact, as mentioned earlier, customers served by ISPs single-homed to MCI-WorldCom backbones could probably find an "on-net" substitute for any content such as

---

[39] "National Backbone Operators: Sprint," *BoardWatch Internet Service Providers Directory for Fall 1997*, Copyright BoardWatch Magazine, 1997, p.204.

a sports information or travel services which was located on non-MCI-WorldCom backbones which were being degraded by MCI-WorldCom. Being able to find these "on-net" substitutes would blunt much of the pressure MCI-WorldCom might receive from its ISP and end user customers for degrading interconnection. Of course, ISPs served by smaller backbones would have a much smaller chance of finding adequate "on-net" substitutes for content served by MCI-WorldCom backbones because smaller backbones serve a much smaller base of content providers.

52. Furthermore, MCI-WorldCom would need to be informed if an existing ISP customer desired to multihome. This information could be used by MCI-WorldCom to deter these customers from multihoming by slowing down their interconnections or other uncooperative behavior designed to keep the ISP single-homed to MCI-WorldCom.

53. Although multihoming theoretically allows customers to route outgoing packets to whatever route they believe is least congested, it does not give them any control over which of their multiple routes are used for incoming packets which are routed by the incoming packets' originating networks. This is confirmed by an article in *Network Computing*:

> With full-BGP routing both ISPs will send the entire Internet routing table. Your router must decide which one of the two possible entries for each Internet destination (one from each ISP) it will put in its routing table. The router will choose the route offering the least cost to a remote network. This allows a fine degree of control over which link is used for outbound traffic to destination networks.
>
> *But controlling which of the two links the Internet uses for inbound traffic is not really feasible.* By one method or another both ISPs have to advertise your Internet number to the rest of the Internet...*It should be understood that you have no way of controlling which link remote hosts will ultimately use to send traffic to your site. Therefore, you have no direct control over the inbound traffic utilization on the Internet links.*[40] [Italics added for emphasis]

54. Thus, many incoming packets are likely to be routed by third parties over interconnection facilities controlled by MCI-WorldCom and would still be subject to degradation. Because most Internet sessions such as web searching require both incoming and outgoing packets, disrupting an inbound route could effectively wreck these sessions and render the multihoming irrelevant from the end user's perspective.

---

[40] Chris Lewis and Thanh Nguyen, "Multihoming Your Internet Service with BGP," *Network Computing*," July 15, 1997.

INTERNET REPLY AFFIDAVIT OF ROBERT G. HARRIS

I hereby swear, under penalty of perjury, that the foregoing is true and correct, to the best of my knowledge and belief.

Robert G. Harris

State of California)

County of Alameda)

Subscribed and sworn to before me this 8th day of June 1998.

Jacqueline O'Neill
Notary Public

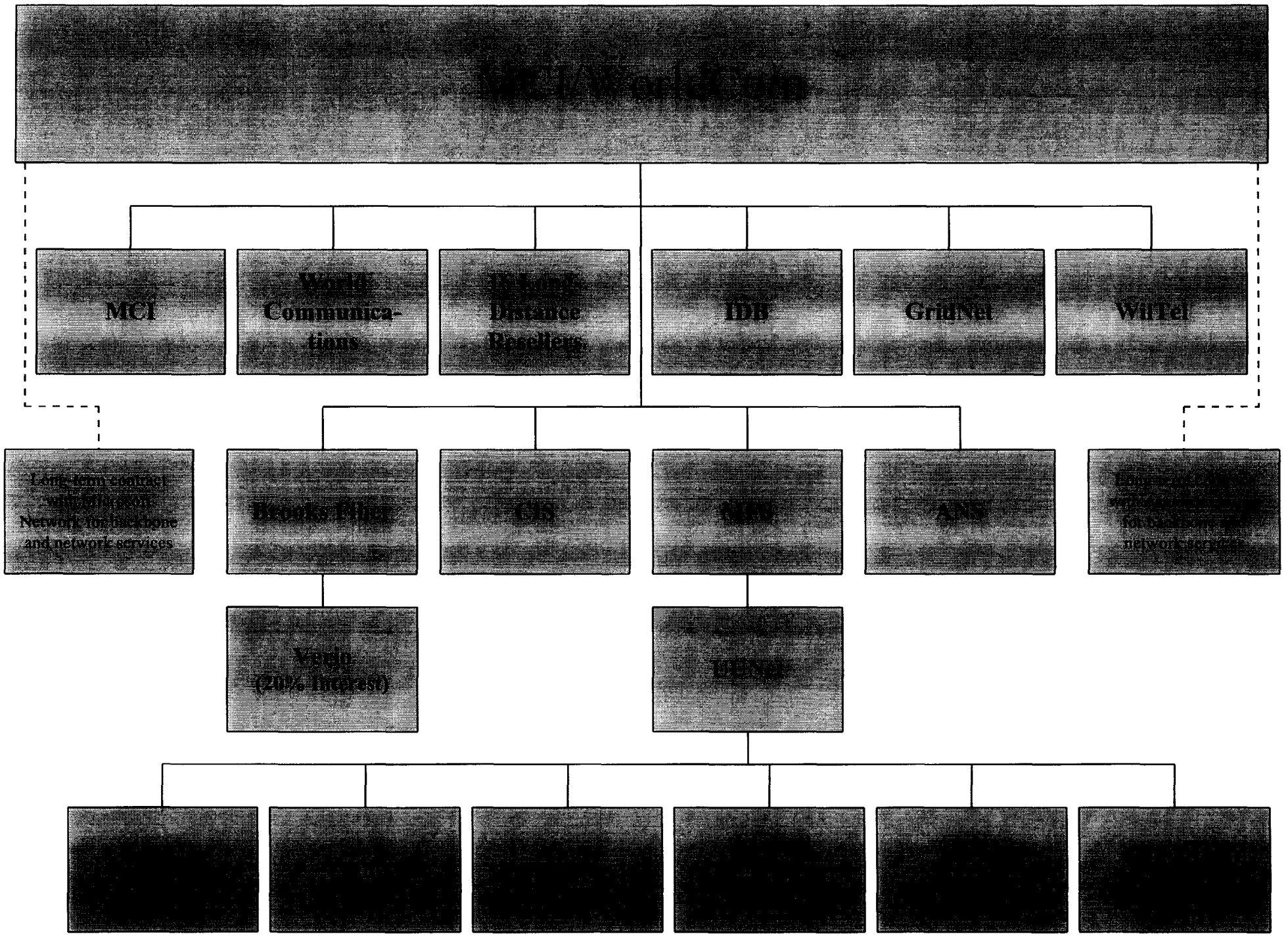
My Commission Expires

Dec 6, 1998

JACQUELINE O'NEILL
Commission # 1119125
Notary Public — California
Alameda County
My Comm. Expires Dec 6, 2000

Appendix 3

The WorldCom/MCI Empire


MCI
World Communications
Distance Resellers
IDB
GridNet
WilTel
Brooks Fiber
CIS
ANS
Verein
(20% Interest)